REMARKS

Applicants respectfully request reconsideration and allowance of the pending claims.

I. Status of the Claims

Upon entry of this amendment, claims 48, 52, 53, 59, and 67-78 remain pending. Claim 79 is new and is supported by paragraph [0002] of the published application.

II. Claim Rejections Under 35 U.S.C. §103(a)

A. Claims 48, 52, 53, 59, and 68-78

Reconsideration is requested of the rejection of claims 48, 52, 53, 59, and 68-78 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of Gulla et al. (U.S. 4,152,164), Parker et al. (U.S. 3,887,732) and either of Yamamoto et al. (U.S. 5,080,982) or Fry et al. (U.S. 5,925,415).

Claim 48 is directed to a method for electroless deposition of a nickel-phosphorus layer with internal compressive stress on substrates, the method comprising:

> contacting the substrates with an electrolyte consisting essentially of:
> nickel acetate,
> a hypophosphite reducing agent,
> a complexing agent comprising 2-hydroxypropanoic acid and propanedioic acid,
> an accelerator,
> a stabilizer, ...
> to thereby electrolessly deposit the nickel-phosphorus layer with internal compressive stress on the substrates, wherein the nickel-phosphorus layer comprises between 2 to 7 wt.% phosphorus, the nickel-phosphorus layer is electrolessly deposited on said substrates at a deposition rate of 7 µm/h to 14 µm/h, and the nickel-phosphorus layer comprising between 2 and 7 wt.% phosphorus is deposited with internal compressive stress throughout a throughput of 14 to 22 MTO; ...

Generally speaking, applicants' invention as manifested in claim 48 provides a nickel-phosphorus coating which has internal compressive stresses to promote pore- and crack-free coating, and the Ni-P layer having compressive stress is deposited at a high throughput rate with long bath life measured in MTOs. The problems with prior processes are documented in applicants' paragraphs [0001] through [0012]; and the achievement of the invention is stated succinctly in [0013]:

> The invention is based on the task of specifying an electrolyte for electroless deposition of metals, from which uniform, pore-free and crack-free metal-phosphorus coatings ***with constant layer properties*** and high phosphorus contents can be deposited at an elevated deposition rate ***over a long period of time.***

The Office has taken the position that it is sufficient to render the claimed invention obvious merely by selecting various disclosures from electroless nickel plating references that describe some aspect or another of the claimed method. Essentially, the Examiner has asserted obviousness can be predicated upon the following:

(1) The method defined by claim 48 requires the deposition of a nickel-phosphorus layer wherein the phosphorus content is between 2 to 7 wt.%. Harbulak et al. discloses "a low phosphorus-nickel alloy" as one of the aspects of their invention. See Col. 3, lines 50-52 of Harbulak et al.

(2) The method defined by claim 48 requires the nickel layer be deposited with internal compressive stress. Harbulak et al. do not allude to this, but Parker et al. show that at higher phosphorus concentrations or even sometimes within the claimed P concentration range, the

nickel-phosphorus layer may have compressive stress. See Parker et al.'s Figures.

(3) The method defined by claim 48 requires a throughput of 14 to 22 MTO. Harbulak and Parker do not disclose this, but Gulla et al. assert that their method can be used to operate an electroless metal deposition composition indefinitely.

(4) The method defined by claim 48 requires the use of an electroless nickel electrolyte comprising a complexing agent comprising 2-hydroxypropanoic acid and propanedioic acid. See Col. 4, lines 20-35 of Fry et al., listing lactic acid and malonic acid in a list of complexing agents, which may be used in "mixtures thereof" or Col. 21, lines 3-14, doing the same and suggesting the use of such complexing agents "alone or in combination."

The various aspects of the claimed method described above are not stand-alone claim limitations in and of themselves such that obviousness is established by the mere recitation of four or five references that disclose these aspects. Rather, the claim is directed to a method which combines these sub-parts into a method that accomplishes a Ni-P layer deposition method that is neither disclosed nor suggested in the prior art. The ordinarily skilled person would have had no basis for appreciating that applicants' discovery that is incumbent on the combination of electrolyte components results in an electroless nickel electrolyte that is capable of depositing a nickel-phosphorus layer comprising a phosphorus content is between 2 to 7 wt.% throughout a throughput of 14 to 22 MTO *and* having internal compressive stress *throughout* a throughput of 14 to 22 MTO using the claimed components of the electroless nickel electrolyte. Thus, the ordinarily skilled person would not have had any reason to make the combination proposed by the Office or have had any reasonable expectation that such a high throughput method could have been successfully carried out.

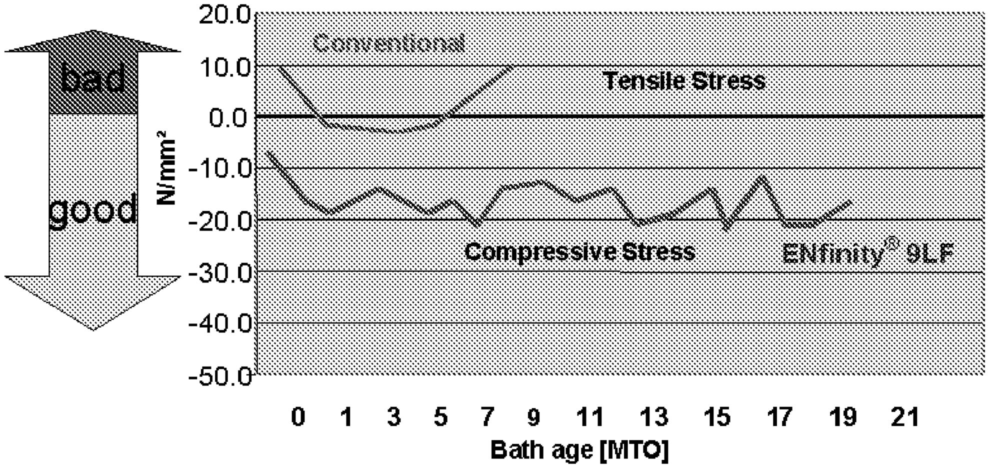
To put this in further perspective, the phosphorus content is within the claimed range ***and*** the nickel layer has an internal compressive stress through the 1 MTO, 2 MTO, 3 MTO, 4 MTO, ... , and 14 or more MTO. The claim feature can be depicted in a table as follows:

MTO	**P content**	**Stress Characteristic**	**Complexing Agents**
1	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
2	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
3	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
4	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
5	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
6	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
7	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
8	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
9	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
10	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
11	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
12	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
13	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid
14	2-7wt.%	Compressive	2-hydroxypropanoic acid and propanedioic acid

The Inventors have shown what the claimed method looks like graphically in their Declaration filed with the Office on May 12, 2008:

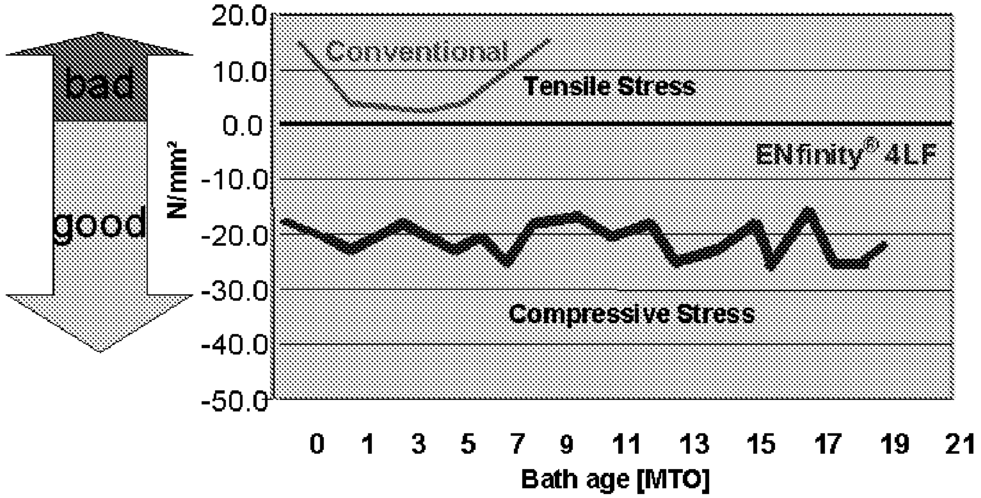
Superior deposit characteristics

-Compressive Stress-



And for low phosphorus:

Unique compressive stress deposits for Low Phos



The blue lines were constructed by measuring the compressive stress of the Ni deposit through 20 MTO. Through each and every MTO, the Ni deposit has a compressive stress, which is characterized by a stress that results in internal compaction (decrease in volume), thereby leading to a nickel layer that is pore-free and crack-free. See applicants' specification at paragraph [0020]. This is in sharp contrast to a metal layer having tensile stress, which is a force that causes elongation, or an increase in volume. Not all metal layers have a compressive stress, as shown in the Declaration filed with the Office on May 12, 2008.

The claimed method further requires that through each and every MTO, the P content is between 2 and 7 wt.% and the stress is compressive. Applicants have never asserted that compressive stresses cannot sometimes be achieved using conventional techniques and commercially available compositions. In the first graph, compressive stress was achieved though about 4 MTO, but before and after this range of MTO, the stress properties of the nickel layer are tensile. Also, the bath only lasted through about 8 MTO. Applicants also do not assert that the P content cannot be held within the range of 2 and 7 wt.% using conventional methods. It may even be possible to use conventional methods to achieve both the compressive stress and the P content through a limited number of MTOs -- although applicants' data as presented in their Declaration regarding low P Ni-P layers do not show a single MTO in which the low P layer's stress property was compressive. Applicants are, however, the first to discover and disclose an electroless nickel electrolyte and method that achieves compressive stress and low P content through each and every MTO between 14 and 22 MTOs.

Therefore, unpatentability of the method defined by claim 48 is not established by the cobbling together of references that disclose one or another piece of the claim particularly since the prior art has not established any nexus connecting the pieces, as applicants have done. Rather, *prima facie* obviousness can only be established if the combination of references discloses or suggests the method as a whole. See *CFMT, Inc. v. Yieldup International Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) citing *In re Royka*, 490 F.2d 981, 985 (CCPA 1974) (obviousness requires a suggestion of all limitations in a claim). A proper obviousness determination requires that the Office make "a searching comparison of the claimed invention - *including all its limitations* - with the teaching of the prior art." See *In re Wada and Murphy*, Appeal 2007-3733 (January 14, 2008), *citing In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) (emphasis in original). Further, the Supreme Court held that obviousness is a question of law based on underlying factual inquiries, including ... ascertaining the differences between *the claimed invention* and the prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966) (emphasis added). MPEP §904 instructs examiners that "The first search should cover the invention as described and claimed, including the inventive concepts toward which the claims appear to be directed."

In sum, it remains well-settled law that obviousness requires at least a suggestion of all of the features in a claim. See *In re Wada and Murphy*, citing *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) and *In re Royka*, 490 F.2d 981, 985 (CCPA 1974)).

Prima facie obviousness is not established herein since the combination of references does not disclose the method as defined by claim 48 as a whole, i.e., there is no disclosure or even the remotest suggestion of a method capable of depositing the NiP layer having the P content and compressive stress through 14 to 22 MTO. Rather, as shown more fully below, the Office has merely found four references that disclose individual, unconnected aspects of the claim but the references would not have given the ordinarily skilled person any basis for bringing these aspects together into a cohesive method meeting all of the limitations of the claim. For example, Fry et al. and Yamamoto et al. disclose the complexing agents within a list of many complexing agents. Harbulak et al. and Gulla et al., *perhaps*, can be taken together for disclosing an extended bath life. (They don't disclose or suggest the 14 to 22 MTO required by the claims, as explained more fully below.) Parker et al. can be taken for showing a method of achieving compressive stress. However, the mere recitation of these aspects is insufficient since there is no suggestion in the prior art of the entire claimed method, or even a suggestion of how the ordinarily skilled person would have or could have successfully melded the references together in some manner to achieve the claimed method. That is, the ordinarily skilled person would not have had any basis for appreciating that the claimed method is much more than a collection of these aspects, despite the fact that the Office is clearly treating it that way. The method defined by claim 48 is the achievement of an electroless nickel plating process that accomplishes the phosphorus content and the internal compressive stress through at least 14 MTO using an electroless nickel composition comprising the claimed combination of complexing agents. This is not disclosed or even suggested, as required by *In re Wada and Murphy*, citing *CFMT, Inc. v. Yieldup Intern. Corp*. Accordingly, *prima facie* obviousness is not established.

Moreover, the *Graham* framework for determining obviousness requires more than the recitation of references describing various sub-parts of a claim that are not connected in any discernible way by the prior art. The Office is also required to show that the ordinarily skilled person would have had a reasonable expectation of successfully achieving the entire method as claimed in view of the prior art (and not the applicants' disclosure). See MPEP §2143.02 **Reasonable Expectation of Success Is *Required*.** In the present case, the ordinarily skilled person would not have had any reasonable basis for successfully modifying the references in the manner proposed by the Office in order to achieve a method that deposits a low P nickel layer having compressive stress throughout at least 14 MTO, particularly in view of Parker et al.'s disclosures that low phosphorus content nickel layers tend toward tensile stress. It is not sufficient to show, as the Office has, that Parker et al.'s method sometimes deposits low P nickel layers having compressive stress, or even through several MTO. Rather, the Office must show that the ordinarily skilled person would have been reasonably confident that Parker et al.'s method could be adapted, per Harbulak et al. and the other references, to achieve a method that deposits a low P nickel layer having compressive stress *throughout* at least 14 MTO. The ordinarily skilled person would have had no such confidence in view of the lack of even the remotest disclosure or suggestion of any such method in the art.

With respect to the references themselves, Harbulak et al. disclose an electroless nickel plating bath and method. As stated in Col. 4, lines 30-50, the nickel ions may be introduced into the bath using sources such as nickel sulfate, nickel chloride, and nickel acetate and the reducing agent may be hypophosphite. The concentration of nickel ions may vary from 1 to 15 g/L, 3 to 9 g/L, or the preferred concentration range from 5 to 8 g/L. Starting at Col. 4, line 50 and ending at Col. 5, line 20, Harbulak et al. disclose complexing agents, including glycolic acid, lactic acid, malic acid, glycine, citric acid, acetic acid, tartaric acid, and succinic acid.

Harbulak et al.'s Example 3 is described starting at Col. 9, line 30. Harbulak et al. state that:

> The bath was periodically replenished to maintain the nickel and hypophosphite ion concentration substantially constant for more than 8 bath turnovers. A bath "turnover" or bath cycle is defined as a plating duration when all of the original nickel metal content in the bath has been consumed and has been replenished by subsequent additions.

The Office has concluded that Harbulak et al.'s statement regarding "more than 8 bath turnovers" means that they provided "no upper limit on the amount of turnovers." If there is no limit, why did Harbulak et al. state "more than 8"? Why didn't Harbulak et al. state that they held the nickel and hypophosphite ion concentrations constant for more than 10 turnovers, or 12, or 14, or 18, or 22? Because of other disclosures immediately following this statement, such as the below:

> Generally, the useful operating life of electroless nickel plating baths in accordance with prior art practice ranges from about 6 to about 10 turnovers before the bath must be discarded.

Moreover, the empirical results shown in Table 3 that the highest number of turnovers achieved was 8.1, and the other MTOs shown were less than 8. Since 8.1 is just slightly "more than 8" the ordinarily skilled person would have thus inferred something far different from "no upper limit." In fact, the ordinarily skilled person would have inferred that 8.1 is perhaps an optimal result given that in the other examples, the maximum MTOs were only 6.4 and 7.8. In view thereof, Harbulak et al. fail to disclose the claim requirement of 14 to 22 MTO.

Applicants particularly request thoughtful reconsideration of the Office's position that Harbulak et al. encompass unlimited turnovers, or even significantly more than 8 turnovers. It is clear that one skilled in the art would see this "more than 8" statement as a laudatory statement meant to approximate the most favorable results achieved. A good bowler with a 256 average describes her average as "more than 250," not as "more than 100." A golfer who shoots 78 and 79 consistently says that he "breaks 80"; he doesn't say that he "breaks 100." To take "more than 8" here to mean they achieved, e.g., 16 turnovers would defy common sense and require taking the statement completely out of context. Applicants therefore respectfully submit that the statement "more than 8" here cannot fairly be deemed to suggest achievement of the claim requirement of 14 to 22 MTOs.

Moreover, the claimed method is not merely directed to a method for depositing nickel through 14 to 22 MTO. The claimed method also requires that the nickel concentration deposited is between 70 and 110 g/L. To meet this claim requirement, the Office has unfairly and inappropriately selected and combined disclosures from Harbulak et al. that bear no relevance to each other. In this regard, the Office has combined the Col. 4 disclosure of nickel concentrations from 1 to 15 g/L with the 8 MTO achieved in Example 3 to assert that Harbulak et al. disclose total nickel throughput ranging from 8 to 120 g/L. This selectivity conveniently ignores that the nickel concentration of the composition of Example 3 was only 6 g/L and that Harbulak et al. explicitly state that only 10 MTO may be achieved "before the bath must be discarded." At most, therefore, Harbulak et al. disclose that the maximum throughput of nickel that may be deposited is only 60 g/L, which falls well short of the minimum required by claim 48.

Additionally, the ordinarily skilled person would not have placed any credibility in the Office's unsupported assertion that one may merely multiply the highest nickel concentration disclosed in Harbulak et al. by the suggested number of turnovers to arrive at a large absolute amount of nickel deposited in view of the cited Gulla et al. reference's disclosure at Col. 2, lines 51-64:

> For example, when plating an active substrate such as aluminum with a nickel plating solution containing ***about seven or more grams of nickel as metal, solution by-products are a serious problem of the third or fourth plating cycle***. For less active substrates, such as catalyzed plastic or non-active metals such as mild steel, by-products are a serious problem by about the 6th to 8th cycle. As a consequence, an electroless solution is frequently dumped after from about 3 to 10 plating cycles thus requiring shutdown of the plating line for preparation of fresh solution resulting in lost time and costs known to be associated with shutdowns and disposal of used solutions.

Gulla et al. clearly establish that higher nickel concentrations (which necessitate higher concentrations of other bath components) are inversely proportional to the number of MTOs achieved. A composition comprising 7 or more grams of nickel encounters serious problems at 4 MTOs. Therefore, if one prepared a Harbulak et al. bath containing 15 g/L nickel with concomitantly high concentrations of hypophosphite, complexing agents, etc., one would assume that the MTO would be low, at most 4, so the maximum nickel throughput would actually be at most about 60 g/L, which is less than the claimed minimum. Any assertion otherwise clearly ignores the experience of the ordinarily skilled person in the art, as evidenced by both Harbulak et al. and Gulla et al.

Gulla et al. has been cited for disclosing that the number of MTOs can be extended indefinitely by a method involving withdrawal of a portion of the plating solution and replenishment. Regardless of whether or not Gulla et al. achieved "infinite operation" which is, of course, impossible to verify, or if the ordinarily skilled person would have been able to combine Harbulak et al. with Gulla et al. and achieve a no upper MTO limit electroless nickel deposition process, there is no evidence in Harbulak et al. or Gulla et al. or Parker et al. or Fry et al./Yamamoto et al. that a method could have been achieved that results in a nickel layer having a P content of 2-7 wt.% and an internal compressive stress through a throughput of 14 to 22 MTO or 70 to 110 g/L of nickel throughput. Assuming for the sake of argument that the Office's point is valid that internal compressive stress is a desired goal as evidenced by Parker et al., the combination of Harbulak et al., Gulla et al., Parker et al., and the newly cited Fry et al. and Yamamoto et al. references would not have made the claimed method obvious in that there is no evidence in these references that the ordinarily skilled person would have or could have synthesized the various references and achieve a method for depositing a nickel layer having a P content of 2-7 wt.% and an internal compressive stress through a throughput of 14 to 22 MTO or 70 to 110 g/L of nickel throughput.

Parker et al. disclose that the stress properties of a nickel plated layer can be influenced by the phosphorus concentration of the nickel layer. Their plating composition is stated to contain nickel, hypophosphite, and lactic acid, among other components. Parker et al. show that compressive stress can be achieved, but they suggest that the phosphorus content of the nickel layer is near the upper end of a range from 3 to 13 percent to do so. At phosphorus concentrations near the low end of the range of 3 to 13 percent, the nickel layer is characterized by tensile stress. See Col. 1, lines 56-61:

> ... coating having a phosphorus content near the lower end of the phosphorus range tending to be in tensile stress and a coating having a phosphorus content near the upper end of the phosphorus range tending to be in compressive stress,...

See also claim 1, which states:

> 1. A method of producing a nickel-phosphorus alloy coating having a predetermined and controlled residual stress in the range of from about +15 ksi tensile stress to about -17 ksi compressive stress therein and chemically deposited on a metal substrate ... to deposit on the metal substrate a nickel-phosphorus coating having ***a phosphorus content of a predetermined value in the range of between about 13 percent and about 3 percent***, maintenance of the pH of the bath at the upper end of ***the pH range coupled with maintenance of the temperature of the bath at the lower end of the temperature range producing a coating having a phosphorus content at the lower end of the phosphorus range*** and maintenance of the pH of the bath at the lower end of the pH range coupled with maintenance of the temperature of the bath near the upper end of the temperature range producing a coating having a phosphorus content at the upper end of the phosphorus range, ***a coating having a phosphorus content near the lower end of the phosphorus range tending to be in tensile stress*** and a coating having a phosphorus content near the upper end of the phosphorus range tending to be in compressive stress, contacting the metal substrate with the bath for a time period sufficient to deposit on the metal substrate a coating having a predetermined thickness of at least about one-tenth mil, removing the coated metal substrate from the bath and cooling the coated metal substrate to ambient temperatures, whereby to produce a metal substrate having chemically deposited thereon a

> nickel-phosphorus coating having a predetermined and controlled residual stress therein.

Parker et al. therefore provide conditions of depositing a nickel-phosphorus layer having a low phosphorus content, but state that these nickel layers are generally characterized by tensile stress. The Office has pointed out that Parker et al. exemplify a Ni-P deposit having a P content of less than 7 wt.% and compressive stress. However, the method defined by claim 48 is not directed to a process in which such results are achieved fortuitously or even intentionally once or even through a few MTO. Rather, the method defined by claim 48 requires the phosphorus content in the Ni layer to between 2 and 7 wt.% and the Ni layer have compressive stress and these conditions persist in the NiP layer through at least 14 MTO, which is not disclose or suggested by the references cited. Moreover, the ordinarily skilled person would have had no basis for concluding that such a method could have been achieved by combining the references.

The Office has completely failed to appreciate that it is not sufficient to cobble together four references that appear to disclose, at first blush, various aspects of the claim. The Office must show that the ordinarily skilled person would have found a reason to and would have been able to successfully meld the references together into a method having the salient claim feature of depositing a Ni-P layer having the P content and the compressive stress through 14 to 22 MTO. Assume for the sake of argument that Harbulak et al. and Gulla et al. can be combined into a method that achieves 14 to 22 MTO that employs the claimed combination of complexing agents, per Fry et al. and Yamamoto et al. There is no evidence at all that the ordinarily skilled person would have been able to discern that this method further achieves the required compressive stress through each and every MTO. In response, the Office has stated that Parker et al. disclose a method for depositing a Ni-P layer having compressive stress. But, Parker et al. discloses that higher P concentrations are generally needed for compressive stresses and applicants' claims are directed to low P concentrations. So, the Office states that Parker et al. show an example in which an Ni-P layer had a 6.2 wt.% P content and compressive stress. Although correct, Parker et al. showed that for one experiment and did not even calculate the MTO. As such, the ordinarily skilled person would have had no basis for concluding that the compressive stress was achieved throughout even one entire MTO, much less at least 14. But, even if Parker et al. achieved the compressive stress through one MTO (which is consistent with applicants' observations that compressive stress can be achieved periodically and even through a couple MTO), what about the next MTO? Would the ordinarily skilled person have been able to conclude that the nickel layer will have the claimed P content and stress properties for the second MTO? And the third? And the fourth? the fifth? Up to 14 to 22 MTO? Was the ordinarily skilled person given the means necessary to achieve compressive stress nickel layers through 14 to 22 MTO? Again, with reference to the Inventor's Declaration filed with the Office on May 12, 2008, electroless nickel compositions available on the market as of the filing date of the Applicant's application were able to achieve compressive stress through some limited number of MTOs, but none of the compositions on the market could do so for 14 to 22 MTO. And further, there is no evidence that these Ni-P layers can be deposited with compressive stress and the required P content through 14 to 22 MTO.

It should be apparent from this discussion that the Office is basing obviousness on hindsight. Even if Harbulak et al. and

Gulla et al. achieve a high number of MTO and Parker et al. disclose conditions for achieving compressive stress, what would have caused the ordinarily skilled person to bring these references together? What would have given the ordinarily skilled person the reasonable expectation of success? It is very telling that, in view of these very old references,[1] the ordinarily skilled person was still employing, at the time of applicant's invention, commercial products that did not achieve the results that the Office asserts is so obvious. That is, commercial products may have been able to deposit NiP layers having compressive stress through a limited number of MTO, but, as applicants have shown in their Declaration, the number of MTOs is much less than the 14 required by the claim. Additionally, commercially available NiP electrolytes may achieve the required P content. But, nothing is available or described in any printed literature that the electrolytes would have been able to deposit NiP layers having both the stress properties and the P content required by the claims, and further requiring these properties persist in the NiP layer through 14 MTO. Market forces drive innovation, but the market has so far completely failed to provide the solution that the applicants' have found. It is only by the use of hindsight that the Office has made this combination because nothing in the references suggests it.

The Office has admitted that "As to applicant's arguments that previously people have not made the combination, referring to the references, this does not show that the combination has never been made or is not suggested from the known art, merely that these references do not explicitly mention it." In one respect, if the Office has admitted that these references fail to disclose or suggest the claimed method, but appears to be saying that perhaps other references may disclose the combination. If that is the case, the rejection contravenes MPEP §706.02, which requires "Prior art rejections should ordinarily be confined strictly to the best available art." Unless an exception applies, but the exceptions listed are not pertinent here. That is, if the Office is admitting that these references do not suggest the claimed method, but other references might, applicants respectfully submit that the Office must withdraw the rejection and find the closest prior art and base the rejection thereon. If, however, the Office is admitting that these references are the closest prior art and the combination is still not disclosed or suggested, then obviousness has not been established and the rejection should be withdrawn and the claims allowed, per *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) and *In re Royka*, 490 F.2d 981, 985 (CCPA 1974)).

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[1] While Fry et al. is about one decade old, the others are much older.

On the other hand, perhaps the Office is suggesting that the compressive stress properties and P content through 14 to 22 MTO may have been met inherently by the combination of references, but these features were not and would not have been recognized by the ordinarily skilled person (particularly since the combination had not been made as of the time of applicants' invention). If that is the case, the Office's argument is reduced to one of latent inherency. That is, the Office's argument is that compressive stress properties through 14 to 22 MTO is a latent inherent feature of the combination of references. It is well settled that latent inherency cannot serve as a basis for obviousness. Inherency and obviousness are different concepts. *In re Shetty*, 566 F.2d 81, 86, 195 USPQ 753, 756 ("inherency is quite immaterial if ...one of ordinary skill in the art would not appreciate or recognize that inherent result."); *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 449, 452 ("the inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.).

In view of the foregoing, applicants respectfully submit that the claimed method is the result of inventive contribution and respectfully request that the rejection be withdrawn.

B. Claim 67

Reconsideration is requested of the rejection of claim 67 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of Gulla et al. (U.S. 4,152,164), Parker et al. (U.S. 3,887,732), GB 2231063, and either of Yamamoto et al. (U.S. 5,080,982) or Fry et al. (U.S. 5,925,415).

GB 2231063 does not correct any of the deficiencies of the other cited references. With regard to metal turnovers, the GB 2231063 inventors *disclose* that their process is limited to 5 MTO. See page 9, line 1. Additionally, GB 2231063 is entirely silent regarding the stress properties of their nickel layer, much less that the nickel layer is deposited having an internal compressive stress. GB 2231063 therefore does not disclose any method for depositing a nickel layer having internal compressive stress through 14 to 22 MTO and 70 to 100 g/L of nickel throughput or provide any guidance whatsoever that would have caused the ordinarily skilled person to conclude that such a method can be achieved through routine experimentation.

In view of the foregoing, claim 67 is patentable over this rejection, and the rejection should be withdrawn.

C. Claims 48, 52, 53, 59, and 68-78

Reconsideration is requested of the rejection of claims 48, 52, 53, 59, and 68-78 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of GB 1243134 and Parker et al. (U.S. 3,887,732). This rejection appears to be also based on either of Yamamoto et al. (U.S. 5,080,982) or Fry et al. (U.S. 5,925,415).

As explained above, applicants' method as defined by these claims is not rendered obvious by a combination of references disclosing disparate, unrelated aspects of the electroless nickel plating method. The reasons stated above for the patentability of the claims apply herein with regard to this rejection as well. That is, applicants' method is directed to an electroless deposition method wherein various parameters and electrolyte components are selected such that the Ni-P layers deposited according to the method have P content between 2 and 7 wt.% and internal compressive stress, and these characteristics of the Ni-P layer persist through 1 MTO, 2 MTO, 3 MTO, and so on through at least 14 MTO, 15 MTO, 16 MTO, 17 MTO, or more, up to 22 MTO. See paragraphs [0020] and [0036].

With respect to this combination, the Office asserts the invention is obvious essentially because:

a) Harbulak et al. teach a nickel-based process employing a nickel electrolyte having some of the same components as required in claim 48,

b) GB '134 teaches 15-20 MTOs,

c) Parker et al. suggest internal compressive stresses, and

d) Fry et al. and/or Yamamoto et al. disclose the same complexing agents within a list of several complexing agents.

As explained above, and it is worth noting again, the invention defined by claim 48 is not rendered obvious merely by the citation of several references that disclose one or another aspect of the claim since the references themselves, either alone or in combination, neither disclose nor suggest the entire method as a whole, as claimed, which requires the deposition of a Ni-P layer having the claimed P content and compressive stress through each of 14 to 22 MTO, nor would the ordinarily skilled person have been able to reasonably meld the references together in a manner that successfully achieves what the applicants have achieved. In view thereof, claim 48 is patentable over this combination of references.

With regard to the references themselves, as explained above, Harbulak et al. achieved just 6.4, 7.8, and 8.1 turnovers with their process (Table 3).[2] GB '134 teaches how to achieve 15-20 MTOs with *its* process. Combining the two references, the Office then asserts that since the GB '134 process achieves 15-20 MTOs, it would have been obvious and simple optimization to get 14-22 MTOs from Harbulak et al.'s process:

> As to the exact number of throughputs provided by the bath, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Harubulak in view of EITHER Yamamoto OR Fry to optimize the amount of turnovers that can be provided as suggested by '134 to provide a desirable reuse of the bath, as Harbulak teaches that more than 8 turnovers can be provided, and does not provide an upper limit, and '134 teaches that a desirable range of metal turnovers when plating nickel with an electroless bath that includes a nickel metal base salt, reducing agent, complexing agent, accelerator and stabilizer is 15-20 times and therefore, since, as discussed in MPEP 2144.05, "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." [Office action, page 24]

Continuing over page 25, the Office concludes

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[2] The Office gratuitously characterizes this as "more than 8 MTOs." This is misleading, because in fact the maximum turnovers Harbulak et al. achieved was 8.1.

> ...it would have been obvious ... to optimize the turnover amounts, which are shown to be a result-effective variable by Harbulak et al.[3] and '134.

Section 2144.05 of the MPEP, upon which the Office relies here, goes on to state in subsection II B:

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)(The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.) See also *In re Boesch*, 617 F2d 272, 205 USPQ 215 (CCPA 1980)(prior art suggested proportional balancing to achieve desired results in the formation of an alloy.)

As explained above, Harbulak et al. explicitly state that the MTO can only range from 6 to 10 before the bath must be discarded and their only empirical evidence of MTO topped out at a maximum of 8.1 MTOs before bath decomposition. Again, it would defy common sense to suggest that Harbulak et al. provide no upper limit in view of their explicit disclosure of an upper limit of 10. The Office has proposed that this person of ordinary skill would see from the GB '134 reference that 15-20 MTOs can be achieved, and then proceed to "optimize the turnover amounts." But just how would this person do so? GB'134, upon which the Office relies for teaching that MTOs can be increased, gives specific guidance:

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[3] Applicants respectfully disagree that Harbulak et al. show MTOs to be result-effective. Harbulak et al. provide no discussion whatsoever as to what factors affect MTO. But it is a moot question because GB '134 does appear to show that MTOs can be increased by using glutamic acid-based complexing agents.

> In practice, using a conventional electroless nickel plating bath consisting of an aqueous solution of a soluble salt such as nickel sulfate hexahydrate and a soluble hypophosphite such as sodium hypophosphite monohydrate, the phosphite concentration resulting from the oxidation of the hypophosphite ions continues to build up until the threshold of nickel phosphite solubility is reached at which time precipitation will occur. This phenomenon has been a major problem in connection with the use of electroless nickel plating baths inasmuch as precipitation of nickel phosphite leads to spontaneous decomposition of the bath around the initially formed precipitate. [GB '134; page 1, lines 30-45.]

> In accordance with the present invention, it has now been found that effective control of the formation and precipitation of nickel phosphite in electroless nickel plating may be achieved through the use of a bath comprising an aqueous solution of a water soluble nickel salt, a water soluble hypophosphite and glutamic acid or a water soluble salt thereof. ***It has been found that glutamic acid and its water soluble salts are highly effective chelating or complexing agents in electroless nickel plating baths and impart superior stability without deleteriously affecting the rate of nickel deposition.*** (emphasis added_[GB '134; page 2, lines 25-45.]

One skilled in the art seeking to increase MTOs from Harbulak et al.'s 8.1 maximum to GB '134's 15-20, therefore, could *only* deduce that to do so, he or she must use "glutamic acid and its water soluble salts" in the baths because they "prevent or substantially minimize the formation and precipitation of nickel phosphite and [such baths] may be operated for more extended periods of time than available prior art baths without decomposition." There is no suggestion in

GB'134 as to how to achieve 15-20 MTOs from a bath which uses, as the complexing agent both 2-hydroxypropanoic acid and propanedioic acid and does not contain glutamic acid.

Other than glutamic acid, the only teaching in any of the references before the Office of how to achieve applicants' 14 to 22 MTOs is in applicants' specification; i.e., the teaching to perform the very specific method of applicants' invention, which is manifested in the express requirements of the preferred embodiment of claim 48. Accordingly, 1) this overall combination of requirements is not disclosed or suggested by Harbulak et al. as admitted in the Office action; 2) the GB'134 reference provides *emphatic* reasons why one seeking to modify Harbulak et al.'s process to increase its MTOs should use glutamic acid as the complexing agent; and 3) the GB'134 reference provides *absolutely no reason* to modify Harbulak et al. to satisfy the specific requirements of claim 48. Applicants therefore respectfully submit that the cited art shows MTO to be result-effective and optimizable only by incorporating glutamic acid; which necessarily and specifically leads to a bath which lacks the express requirements of claim 48.

Similarly, neither Harbulak et al. nor GB '134 state that their processes deposit a nickel layer having internal compressive stress. Parker et al. teach how to achieve internal compressive stresses with *their* process, but not with Harbulak et al.'s process. Yet, the Office is asserting essentially that since Parker et al. teach how to obtain internal compressive stresses with the Parker process, it would have been obvious how to obtain internal compressive stresses with the GB'134-modified Harbulak et al. process:

> It further would have been obvious to modify Harbulak in view of '134 and EITHER Yamamoto OR Fry to control bath conditions to apply the nickel plating with internal compressive stress throughout as suggested by Parker in order to provide desirable increase in adhesion to the substrate, as Harbulak in view of '134 and EITHER Yamamoto OR Fry teach to provide nickel electroless plating with phosphorous, and Parker teaches that when providing nickel plating with phosphorous, the plating can desirably be performed to provide compressive stress in the plating so that increased adhesion to the substrate is provided. [Office action, page 25]

As explained above, Parker et al. determined that compressive stress may be achieved using high phosphorus content, but lower phosphorus contents, such as in the claimed range of 2 to 7 wt.%, generally deposit coatings having tensile stress. In response, the Office has cited an example Parker et al. Ni layer having a P content of 6.2 wt.% and a compressive stress. However, Parker et al. did not disclose that such compressive stress may be achieved through even 1 MTO, much less the 14 to 22 MTO required in the claim. In view thereof, the combination of references cited by the Office do not disclose or even suggest the method defined by the claims, nor would the references have provided the ordinarily skilled person with any reasonable expectation that the references could have been successfully combined into the method defined by the claims.

Applicants have discovered, contrary to the expectations of Parker et al., a method that achieves deposition of nickel layer having a P content within the claimed range and having internal compressive stresses throughout an extended bath life of 14 to 22 MTO. None of the references disclose that internal compressive stress can be achieved in the as-deposited nickel layer through 14 to 22 MTO and a throughput of 70-110 g/L nickel.

Claim 48 is therefore patentable because as admitted in the Office action, Harbulak et al. do not disclose myriad claimed requirements or process conditions, including, among others, i) deposition rate, ii) nickel concentration, iii) throughputs/MTOs, iv) self-regulating pH, and v) internal compressive stress in the as deposited layer through an extended number of MTOs; and there is no evidence in '134, Parker et al., Yamamoto et al., and Fry et al. that Harbulak et al. may be modified in order to achieve the process having all the express requirements of claim 1.

The other pending claims are patentable for these same reasons and by virtue of the other elements they require.

D. Claim 67

Reconsideration is requested of the rejection of claim 67 as being obvious over Harbulak et al. (U.S. 4,486,711) in view of GB 1243134, Parker et al. (U.S. 3,887,732), and either of Yamamoto et al. (U.S. 5,080,982) or Fry et al. (U.S. 5,925,415), and further in view of GB 2231063.

GB 2231063 does not correct any of the deficiencies of the other cited references. With regard to metal turnovers, GB 2231063 *discloses* that its process is limited to 5 MTO. See page 9, line 1. Additionally, GB 2231063 is entirely silent regarding the stress properties of their nickel layer, much less that the nickel layer is deposited having an internal compressive stress. GB 2231063 therefore does not disclose how to deposit a nickel layer having internal compressive stress through 14 to 22 MTO and 70 to 100 g/L of nickel throughput or provide any guidance whatsoever that would have caused the ordinarily skilled person to conclude that such a method can be achieved through routine experimentation.

In view of the foregoing, claim 67 is patentable over this rejection, and the rejection should be withdrawn.

CONCLUSION

Applicants do not believe that a fee is required for the filing of this response, as it is being submitted within the three-month shortened statutory period for reply. Should applicants be incorrect, the Commissioner is hereby authorized to charge the necessary fee to Deposit Account No. 19-1345.

Respectfully submitted,

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